

MySignals

User Manual



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1. Introduction

The aim of this manual is to introduce the user to MySignals in a practical way.

This document applies to MySignals product, approved for FCC and IC:

Model	FCC ID	IC
MySignals	XKM-MYSIGNAL-V1	8472A-MYSIGNALV1

2. General and safety information

The following list shows just some of the actions that produce the most common failures and warranty-voiding cases.

Failure to comply with the recommendations of use will entail the guarantee cancellation.

Software:

- Update firmware version only using MySignals Updater Tool. If a different Software is used, MySignals can be damaged and can become unresponsive. This use is not covered under warranty.
- Use only MySignal Web Server Application or MySignals Mobile APP in order to configure and setup your account and device.
- Do not unplug any connector while uploading code. MySignals can become unresponsive. This use is not covered under warranty.
- Do not connect or disconnect any sensor or connector while MySignals is ON. MySignals can become unstable or unresponsive, and internal parts can be damaged. This fact is not covered under warranty.

Hardware:

- Do not handle black stickers seals on both sides of the enclosure (Warranty stickers). Their integrity is the proof that MySignals has not been opened. If they have been handled, damaged or broken, the warranty is void.
- Do not open MySignals in any case. This will automatically make the warranty void.
- Do not handle the four metallic screws of MySignals.
- Do not submerge MySignals in liquids.
- Do not place nodes on places or equipment where it could be exposed to shocks and/or big vibrations.
- Do not expose MySignals to temperatures below -10°C or above 50°C.
- Do not connect any sensor not provided by Libelium.
- Do not power MySignals with other power sources than the original provided by Libelium.

3. MySignals's Hardware Setup

All the items included in the basic kit of MySignals are in their specific compartments in MySignals briefcase.



Figure : Mysignals briefcase

3.1. Power Supply

General power supply

Operating Current	2 A
Operating Voltage	5V
Input Voltage (recommended)	12V
Input Voltage (limit)	10-20V

Specific power supply

DC Current per I/O Pin	20 mA [Max]
DC Current for 3.3V	1 A [Max]
DC Current for 5V	1 A [Max]
DC Current for 4 V Pin	2 A [Max]

Plug in /out the power supply adapter included with MySignals to turn ON or OFF the device. Make sure that the power adapter is indoors.

Plug it into the corresponding power supply connector. At Libelium we offer equipment for operating at 12V, do not use other power supplies.

You can see all the information about the power supply in the label included in MySignals device.

3.2. Sensors

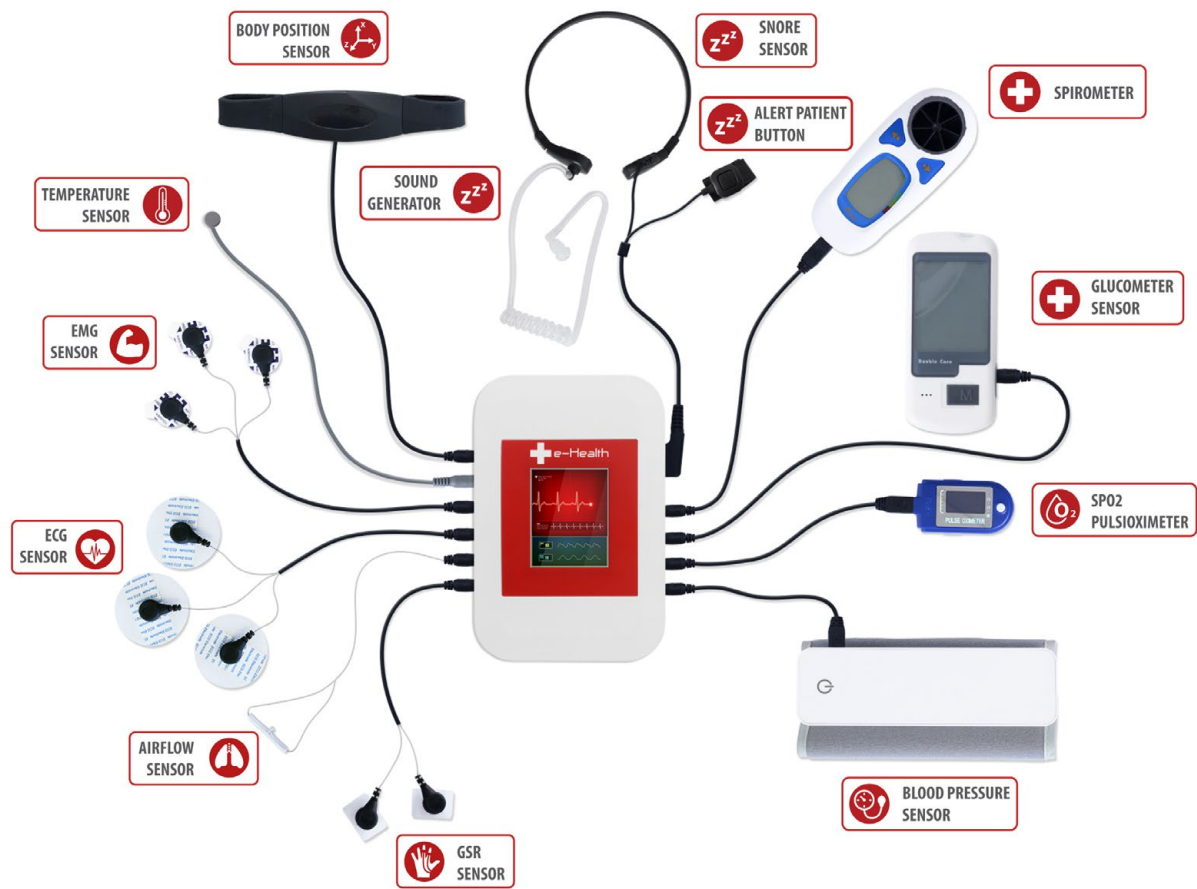


Figure : Mysignals sensors

You can find all the sensor connectors indicated in both sides of the device.

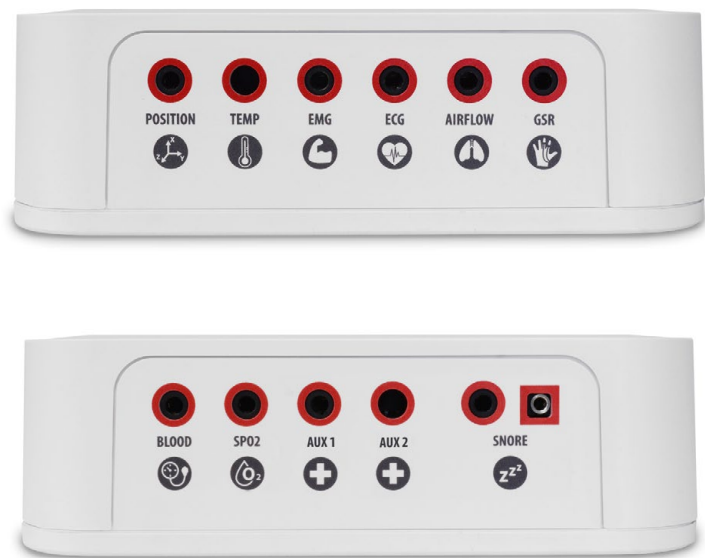


Figure : Mysignals sensor connectors

Connect the correct sensor in each specific connector as you can see in the following images:



Figure : Connecting one sensor

This information is used to monitor in real time the state of a user or to get sensitive data in order to be subsequently analysed for biometric analysis. Biometric information gathered can be wirelessly sent using two connectivity options available: Wi-Fi or Bluetooth Low Energy 4.0.



Figure : MySignals BLE sensors

Data can be sent to the Cloud in order to perform permanent storage or visualized and stored in real time by sending the data directly to a Smartphone. iPhone and Android applications have been designed in order to easily manage and storage the user's information.

Snore Sensor

Description: This sensor attaches to the neck and records vibration associated with a piezo sensor.

Measurement:

Parameter	Unit	Range
Respiratory rate	BPM (breaths per minute)	0-60 bpm

Patient Position Sensor

Description: The Patient Position Sensor (Accelerometer) monitors five different user positions (standing/sitting, supine, prone, left and right.). Body Position Sensor uses a triple axis accelerometer to obtain the user's position.

Measurement:

Parameter	Unit	Range
Body Position	Dimensionless	5 different positions

Body Temperature Sensor

Description: Exacon D-S18JK sensor allows you to measure this key parameter for body monitoring.

Measurement:

Parameter	Unit	Range
Body Temperature	Degree Celsius (°C)	0-50°C

Electromyography Sensor (EMG)

Description: An electromyograph detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated. The signals can be analyzed to detect biometric abnormalities, activation level, recruitment order or to analyze the biomechanics of human or animal movement.

Measurement:

Parameter	Unit	Range
Muscle signal	Volts	0-5V

Electrocardiogram Sensor (ECG)

Description: The electrocardiogram (ECG) is a diagnostic tool that is routinely used to assess the electrical and muscular functions of the heart. The sensor use "Continuous telemetry electrocardiogram" for a prolonged monitoring including the use of three ECG electrodes.

Measurement:

Parameter	Unit	Range
Electrocardiogram signal	Volts	0-5V

Airflow Sensor (Breathing)

Description: The nasal / mouth airflow sensor is a device used to measure the breathing rate in a user in need of respiratory help or person. This device consists of a flexible thread which fits behind the ears, and a set of two prongs which are placed in the nostrils. Breathing is measured by these prongs.

Measurement:

Parameter	Unit	Range
Respiratory rate	BPM (breaths per minute)	0-60 bpm
Breathing intensity	Volts	0-3.3V

Galvanic Skin Response Sensor (GSR - Sweating)

Description: This sensor measures the electrical conductance of the skin, which varies with its moisture level. This is of interest because the sweat glands are controlled by the sympathetic nervous system, so moments of strong emotion, change the electrical resistance of the skin.

Measurement:

Parameter	Unit	Range
Conductance	Siemens	0-20Siemens
Resistance	Ohms	10K-100KOhms
Voltage	Volts	0-5V

Blood Pressure Sensor (Sphygmomanometer)

Description: Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats).

Measurement:

Parameter	Unit	Range
Systolic pressure	mm Hg	0-300 mmHg
Diastolic pressure	mm Hg	0-300 mmHg
Pulse	ppm	30~200 ppm

Auxiliar input 1

Description: This are generic inputs for possible a UART interface sensors

Auxiliar input 2

Description: This are generic inputs for possible a UART interface sensors

Pulse and Oxygen in Blood Sensor (SPO2)

Description: Pulse oximetry a noninvasive method of indicating the arterial oxygen saturation of functional hemoglobin. Oxygen saturation is defined as the measurement of the amount of oxygen dissolved in blood, based on the detection of Hemoglobin and Deoxyhemoglobin. Two different light wavelengths are used to measure the actual difference in the absorption spectra of HbO₂ and Hb.

Measurement:

Parameter	Unit	Range
Pulse	ppm	25~250 ppm
SPO2	%	35-100%

Spirometer

Description: MSA100 Peak Flow Meter is a hand-held pulmonary function measuring device that measures your maximum possible exhalation which is called peak expiratory flow (PEF) and forced expiratory volume in 1 second (FEV1). FDA,ISO,CE.

Measurement:

Parameter	Unit	Range
Volume	l	0.01L~9.99L
Air flow	l/min	50 L/min ~900L/min

Wireless Electroencephalography sensor (EEG)

Description: EEG headset that safely measures and transfers the power spectrum (alpha waves, beta waves, etc) data via Bluetooth to wirelessly communicate with the device. This headset can be simply slipped on to be able to see your brainwaves change in real time.

Measurement:

Parameter	Unit	Range
Brain waves: alpha waves, beta waves...	Percentage	0-100%

Wireless Blood Pressure Sensor (Sphygmomanometer)

Description: Blood pressure is the pressure of the blood in the arteries as it is pumped around the body by the heart. When your heart beats, it contracts and pushes blood through the arteries to the rest of your body. This force creates pressure on the arteries. Blood pressure is recorded as two numbers—the systolic pressure (as the heart beats) over the diastolic pressure (as the heart relaxes between beats).

Measurement:

Parameter	Unit	Range
Systolic pressure	mm Hg	0-300 mmHg
Diastolic pressure	mm Hg	0-300 mmHg
Pulse	ppm	30~200 ppm

Pulse and Oxygen in Blood Sensor (SPO2)

Description: Pulse oximetry a noninvasive method of indicating the arterial oxygen saturation of functional hemoglobin. Oxygen saturation is defined as the measurement of the amount of oxygen dissolved in blood, based on the detection of Hemo and Deoxy.

Measurement:

Parameter	Unit	Range
Pulse	ppm	25~250 ppm
SPO2	%	35-100%

Wireless Body Scale

Description: Multipurpose personal portable digital weight health body scale

Measurement:

Parameter	Unit	Range
Weight	Kilograms	5-150Kg
Bone	Percentage	0-100%
Body fat	Percentage	0-100%
Muscle mass	Percentage	0-100%
Body water	Percentage	0-100%
Visceral fat	Percentage	0-100%
BMI	Kcal	0-500Kcal
BMR	Kcal	0-500Kcal

3.3. Data Visualization

The e-Health library include graphic TFT for visualizing data. This 2.45-inch TFT LCD serial SPI integrated features of compact, SPI interface, fully compatible with popular LCD5110 interface cable sequence.

As a bonus, this display has a resistive touchscreen attached to it already, so you can detect finger presses anywhere on the screen.

Feature:

- TFT01_2.4 SP is a 2.4 "SPI TFT LCD Screen Module
- 3.3V Power Supply pin

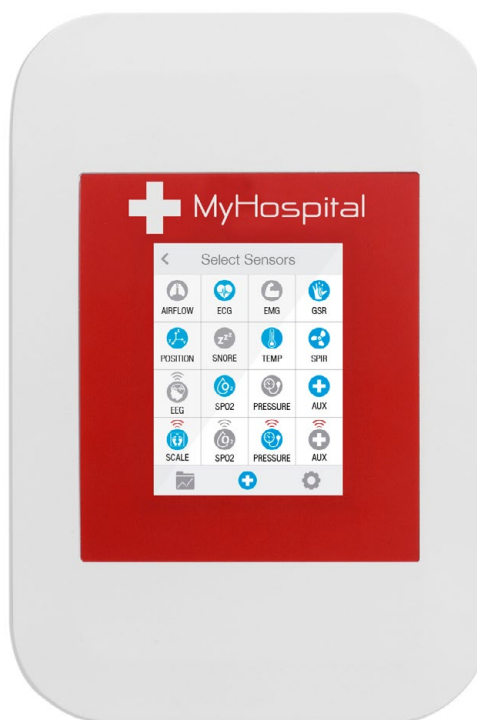


Figure : MySignals top view

3.4. Mini USB Data Transfer

This connector is used to update code into MySignals with a male USB to male Mini USB cable provided by Libelium. Just connect one side of the cable to this connector, removing protection cap from MySignals and connect the other side to a PC to update a code.

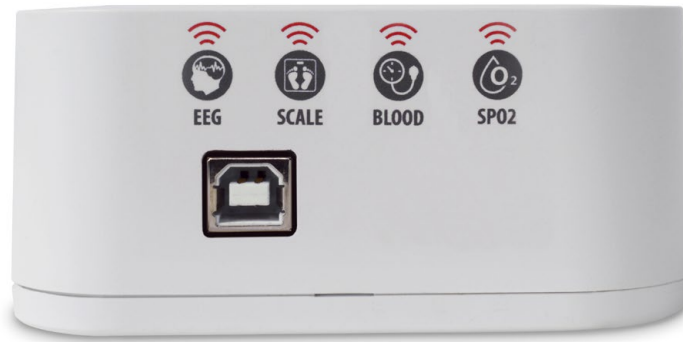


Figure : USB connector and protective cap

When uploading processes are finished, do not forget to use again protection cap to avoid connector damage.

3.5. Wireless Communication

By default MySignals has two internal antenna for WiFi and BLE communication.

4. MySignals Software Installation

All programs that you can use with MySignals can be found on:

www.libelium.com/development/mysignals/sdk_and_applications

4.1. MySignals Updater Tool

MySignals Updater Tool is the official firmware download tool developed by Libelium.

Step-by-step instructions for setting up the MySignals Updater Tool on your computer and connecting it to MySignals devices.

Start by visiting [Libelium website](http://libelium.com) and selecting the Mac, Windows, or Linux version, depending on what machine you have. Installation on each machine is straightforward:

- On Windows, you'll have a .zip file. Double-click it, and drag the folder inside to a location on your hard disk. It could be Program Files or simply the desktop, but the important thing is for the processing folder to be pulled out of that .zip file. Then double-click Mysignals_Updater.exe to start.
- The Mac OS X version is also a .zip file. Double-click it and drag the MySignals Updater Tool icon to the Applications folder. If you're using someone else's machine and can't modify the Applications folder, just drag the application to the desktop. Then double-click the MySignals Updater Tool icon to start.
- The Linux version is a .tar.gz file, which should be familiar to most Linux users. Download the file to your home directory, then open a terminal window, and type: `tar xvfz Mysignals_Updater-xxxx.tgz`

It is important to use the version found on [Libelium website](http://libelium.com) and no other version. This is because the version available on the Libelium website has been properly tested and for which we can assure optimum operation.

4.2. MySignal Web Server Application

Telemedicine is the use of telecommunication and information technologies in order to provide clinical health care at a distance. It helps eliminate distance barriers and can improve access to services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations.

MySignals allows to share data with the cloud, and perform real-time analysis. Thanks to many communications modules can send data over several transmission protocols.

MySignalsWeb Server Application is a real-time large-dataset viewing and plotting tool and has built-in data analysis functionality. It is very user-friendly and contains many powerful built-in features. MySignal Web Server Application is an application that allows you to configure Mysignals for creating profiles and users and help you to visualize all the data measured.

This application is available in:

www.mysignals.com

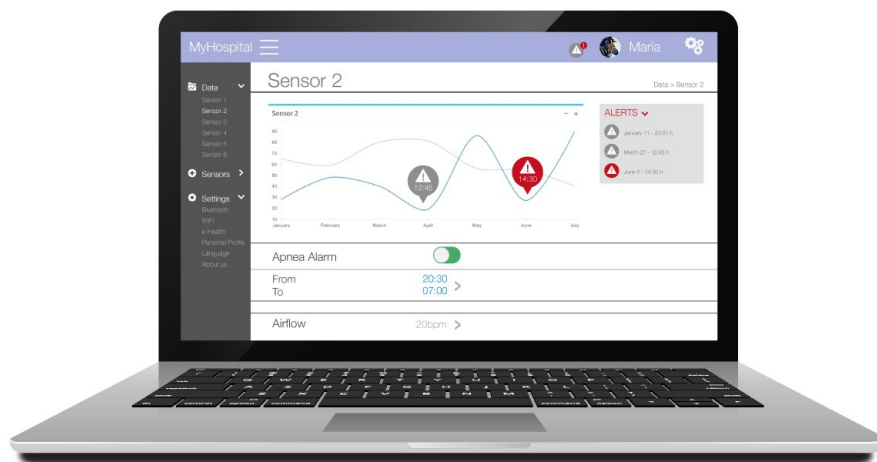


Figure : MySignals Web Server Application

4.3. MySignals Mobile APP

We have developed the application e-Health Sensor Plattform, for both iPhone and Android platforms. The application may be also downloaded from the official App markets or from the Libelium website for free: <http://www.cooking-hacks.com/apps>



Figure : MySignals Mobile APP

Connecting to an iPhone

a) Download the application from App Store:

b) Download the application (MySignals.ipa) from the Libelium website: <http://www.libelium.com/apps>

- Then double click on the icon, or right click and open with iTunes.
- Inside iTunes, on the left panel, click on DEVICES->Your Device.
- Select on the top "Apps", and select Sync Apps. Drag into the desired screen e-Health app.

Once installed, the app appears in your iPhone/iPod screen.

The App shows the information the nodes are sending which contains the sensor data gathered.

Android app tutorial

a) Download the application from App Store:

b) Download the application (MySignals.apk) from the Libelium website: <http://www.libelium.com/apps>

The App shows the information the nodes are sending which contains the sensor data gathered.

5. Accessing MySignals Data

MySignals works in several models, we have to think about a person who does not have a mobile phone and this person does not have internet connectivity, the simplest case, then let's explain each mode:

Standalone mode: MySignals does not send data to a mobile phone or cloud (no connectivity at all), there is only a single (or many) MySignals device isolated. With this mode the MySignals device will store data for a period of time and it cannot be sent to nowhere.

Standalone + connectivity (WiFi): MySignals is not paired with a mobile phone but it has internet connection. MySignals device will store data in its system and then it will send data to libelium's cloud service.

BLE mode: MySignals + mobile phone. MySignals device will send data to mobile phone and it will feed MySignals application, this way the mobile phone will update data to Libelium's cloud, then the mobile phone will be able to store all data into a local database to cover situations where the phone does not have connectivity.

MySignals device will send data to application using two modes:

In **Datagram** mode the MySignals device will send all values for all sensors, this is used for main sensors screen where we show a list of selected sensors by the user with its values.

Regarding to **Detail mode**, it is used when the application shows a detailed view from sensor, MySignals will only send data for this single selected sensor. The application will send a sign to MySignals to switch on and off this mode.

When the MySignals device establish a pairing with the application it send information in Datagram mode by default. Let's show a little graph to understand each mode:

5.1. MySignals Standalone Screen

The sensor measures are distributed in different screens that change by pressing in the Screen.

In the first screen you can configure the operating mode: BLE, WIFI or standalone.

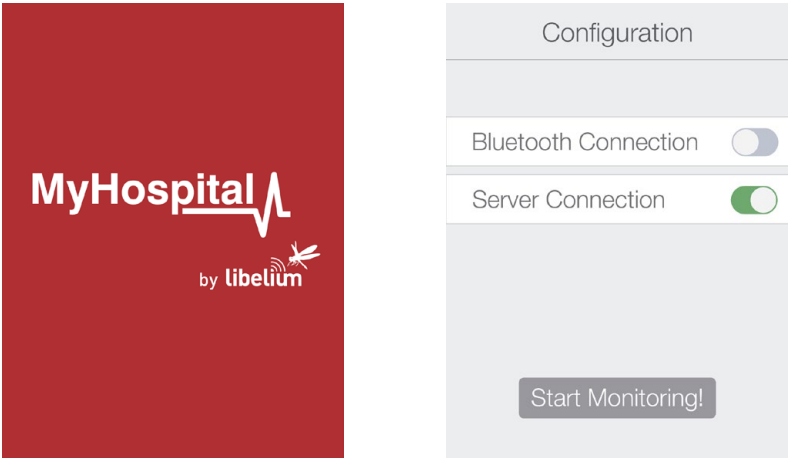


Figure : MySignals configuration screen

In bluetooth mode you can configure the connection and then MySignals APP will start to receive data from MySignals.

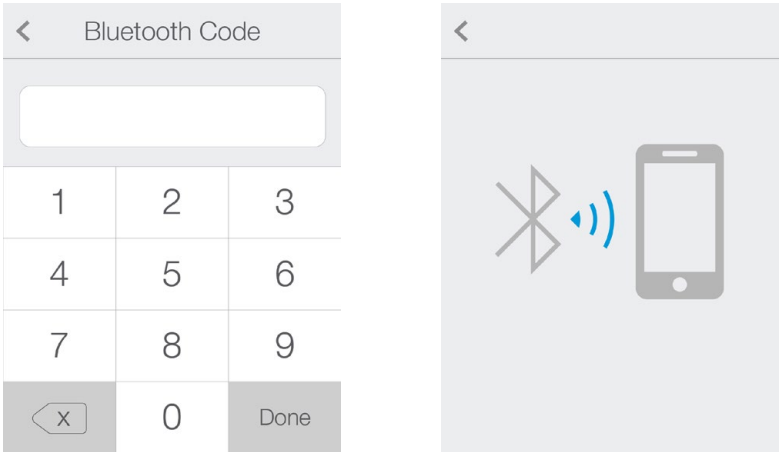


Figure : Bluetooth mode configuration screen

In standalone or WiFi mode you can select the sensor that you want to monitor and MySignals will start to monitor all the parameters.



Figure : MySignals Data monitoring screens

There are several basic configuration screens: language, profile, user...

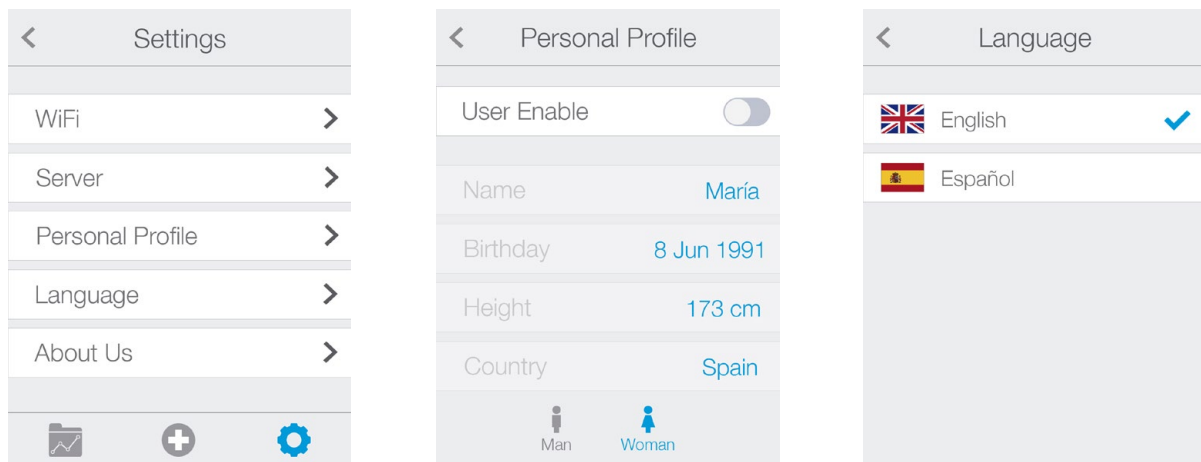


Figure : MySignals basic configuration screen

5.2. MySignals Web Server Application

MySignals application will have an user account to login into the system, this account is important to make cloud call and store information. If the user does not have an account the user cannot use MySignals application.

Each account will be able to have one or more profiles, let's think about a doctor that has many users, each user is a profile.

Each profile should be synchronized with cloud to be up-to-date with user information.

When the user start the MySignals application for the first time and setup assistant prompts the user will be able to create a profile once the user logs in.

MySignals must have a credentials screen where it show which user is logged in into our system and this screen will be able to log out the user and ask again for credentials in order to keep using the application.

To configure MySignals application for each device, we will need to set common parameters.

You can see all the data of each device or user in the User Data section.

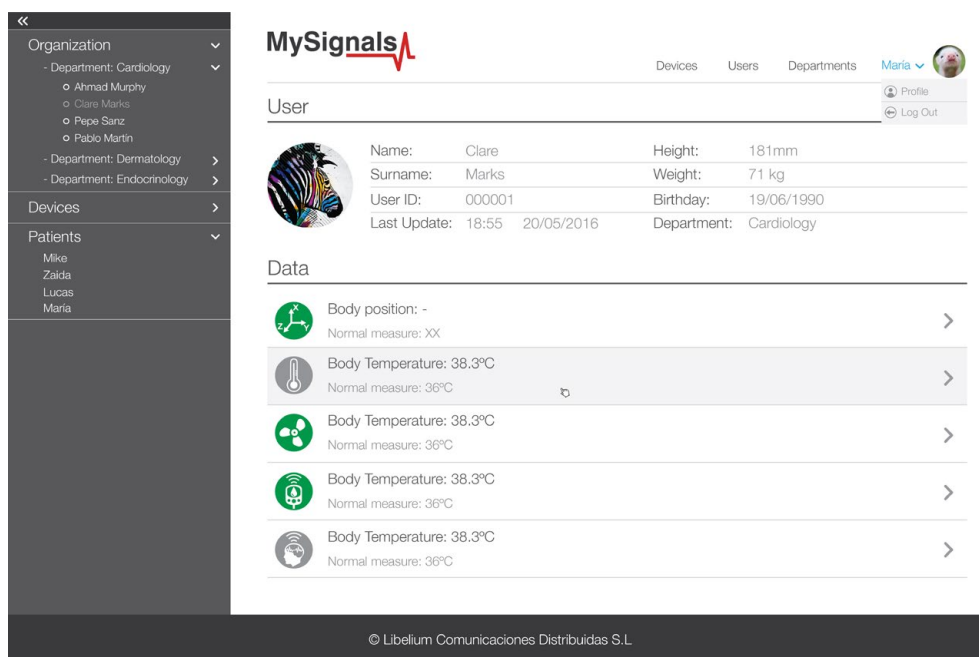


Figure : User Data MySignals Web

Using the Department, User or Device configuration sections you can create, configure or delete them.

<<

Organization

- Department: Cardiology

- Department: Dermatology

- Department: Endocrinology

Devices

Patients

Mike

Zaida

Lucas

Maria

MySignals

DevicesUsersDepartments

Departments

Cardiology

Dermatology

Endocrinology

Figure : Department configuration MySignals Web

<<

Organization

- Department: Cardiology

- Department: Dermatology

- Department: Endocrinology

Devices

Patients

Mike

Zaida

Lucas

Maria

MySignals

DevicesUsersDepartments

Users

Surname

Name

Height

Weight

Birthday

Department

Description

Marks

Lian

Ahmad

Martin

User configuration MySignals Web

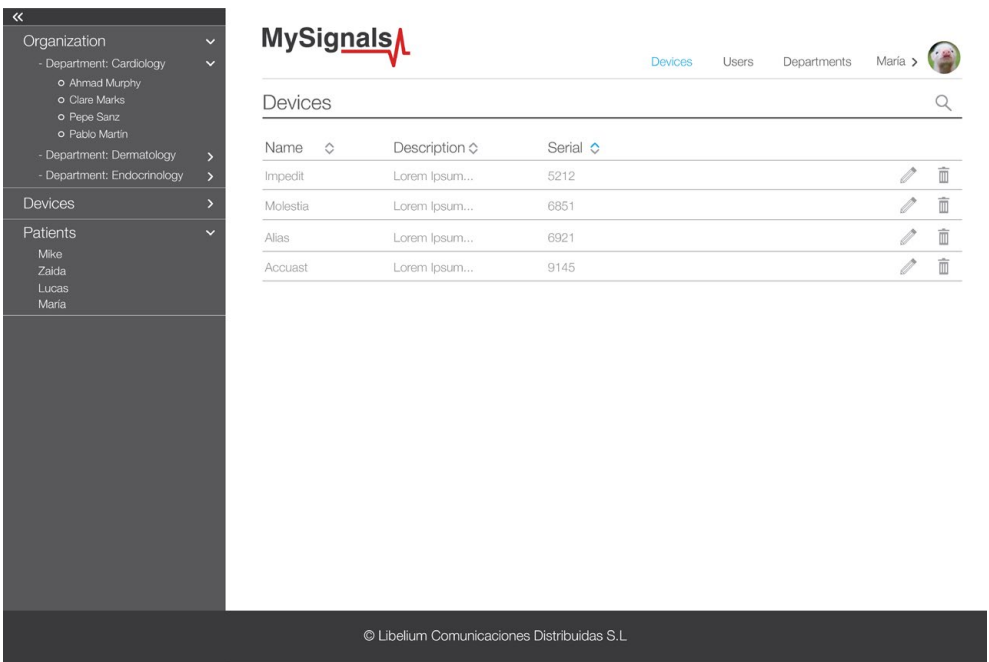


Figure : Device configuration MySignals Web

You can configure too your personal profile.

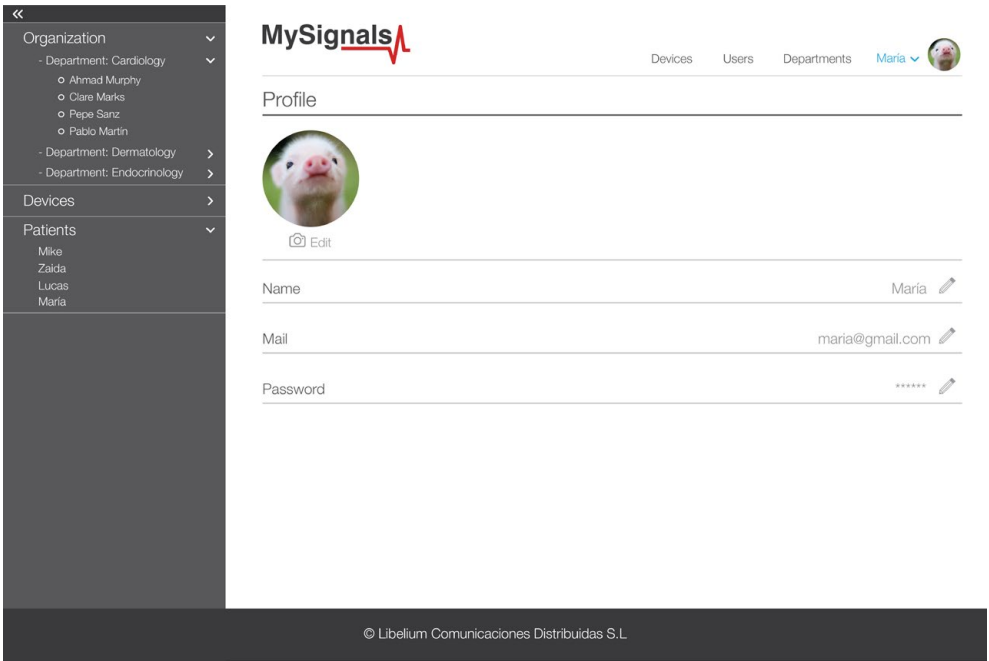


Figure : Personal profile MySignals Web

How do I ensure the privacy of the biometric data sent?

Privacy is one of the key points in this kind of applications. For this reason the platform includes several security levels:

- In the communication link layer: WPA2 for Wifi.
- In the application layer: by using the HTTPS (secure) protocol we ensure a point to point security tunnel between each sensor node and the web server (this is the same method as used in the bank transfers).

5.3. MySignals Mobile APP

The Bluetooth connectivity may perform direct communications with iPhone and Android devices without the need of an intermediate router.

The first time a user starts MySignals application, it will be needed a setup assistant to configure all aspects related to MySignals configuration like user name, password (already set in our back end), profile, WiFi settings and MySignals selection. We will create a setup assistant with straightforward screens with all field and information to guide the user through this assistant. Design department had provided some sketches with an idea about how assistant can be done, these images represent each step in our assistant:

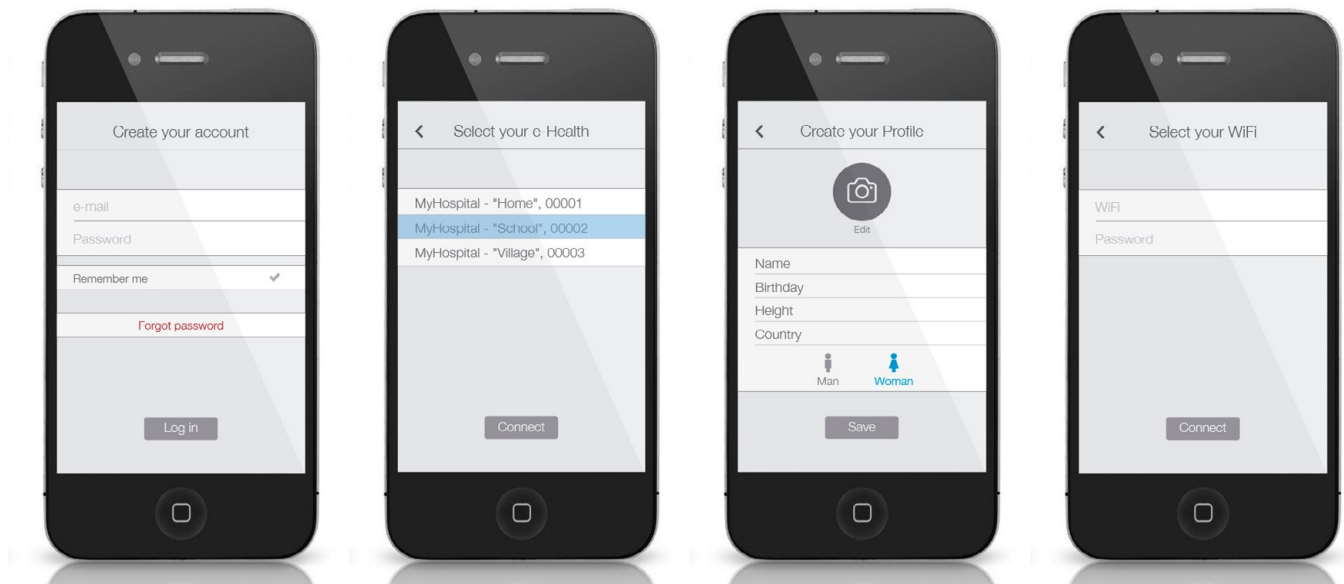


Figure : MySignals APP configuration screen

An account can have one or more MySignals devices, this is why an user can purchase more than one device. Then we must create an MySignals manager to provide a list of devices and perform some basic operation over them.

This manager can add/delete/modify/select an MySignals device. This information should be synchronized with cloud to get all devices up to date for a given account.

As each MySignals is tied to each single user, we should download a list of devices each time an user log in, this way we do not mix MySignals from different accounts.

In the first screen you can configure the operating mode: BLE, WIFI or standalone.

Then you can select the sensor that you want to monitor and MySignals will start to monitor all the parameters.

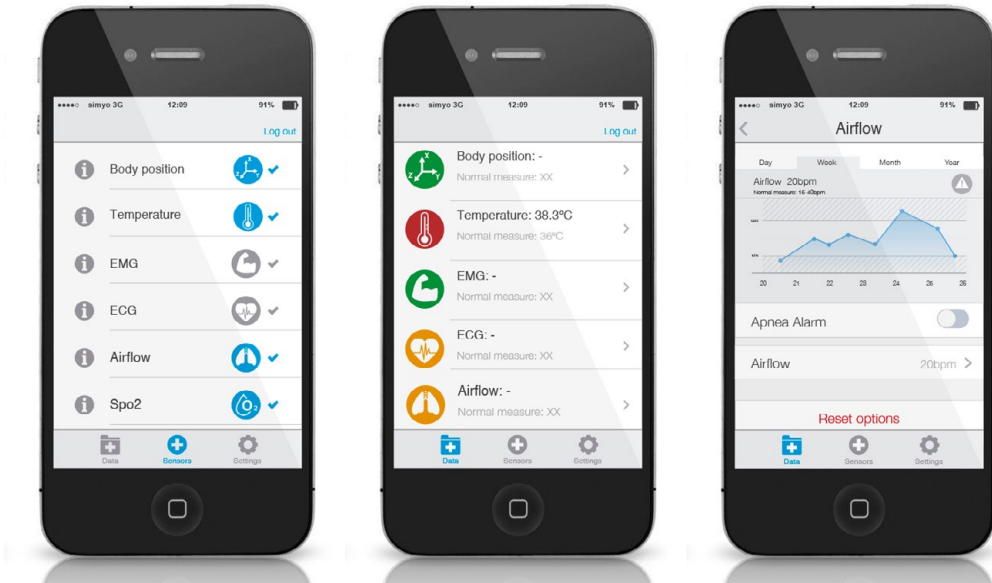


Figure : MySignals APP Data monitoring screens

There are several basic configuration screens: language, profile, user...

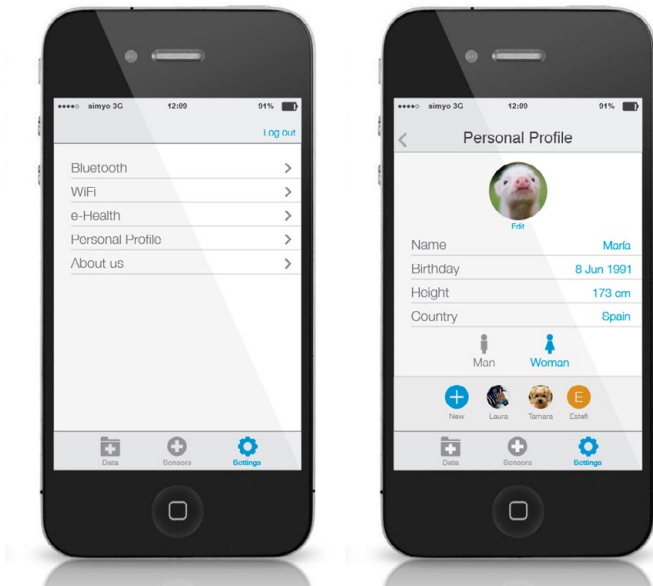


Figure : MySignals basic configuration screen

6. Updating a New Firmware to MySignals

Using the USB connector, a new firmware version can be uploaded to MySignals without opening the enclosure. Just connect one side of the USB cable to this connector, removing protection cap if necessary and connect the other side to a PC. Next steps describe this process in detail.

6.1. MySignals Updater Tool

Step 1: Open the USB connector

Remove the protection cap of the USB connector.

Step 2: Connect the USB cable to MySignals

Connect one side of the male-to-male USB cable to the USB connector.

Step 3: Connect the USB cable to the PC

Connect the other side of the USB cable to your PC.

Step 4: Open MySignals Updater Tool

Now open MySignals Updater Tool. If you do not have MySignals Updater Tool already installed in your PC, then go to the Development section of Libelium website to download it.

Step 5: Select the corresponding firmware version

Select the firmware version corresponding to MySignals going to tools/board. If you do not have the API for MySignals, please go to the Development section of Libelium website and download it.

Step 8: Select the USB port

Select the corresponding serial port by going to tools/serial port. If you are unable to see the proper USB port maybe you should install the latest FTDI drivers on your PC.

Step 9: Upload the firmware

The IDE should say "Done Updated".

7. Certifications Information

This document applies to the following MySignals models, approved for FCC and IC:

Model	FCC ID	IC
MySygnals	XKM-MYSIGNAL-V1	8472A-MYSIGNALV1

7.1. USA and Canada Certification

Modification statement

Libelium has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Interference statement

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Wireless notice

This device complies with FCC/ISED radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the ISED radio frequency (RF) Exposure rules. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device needs to be installed and used on distance greater than 20 cm from human body.

For FCC Part 15 – Class B device: digital device or peripheral

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modification statement

Libelium n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference statement

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Wireless notice

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

Cet appareil doit être installé et utilisé à une distance supérieure à 20 cm du corps humain.

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne NMB-003.